APPARATUS FOR SUPPORTING AN AUDIO/VIDEO SYSTEM WHICH INCLUDES A THIN SCREEN VIDEO DISPLAY UNIT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to United States provisional application number 60/538,216 filed January 23, 2004, entitled "APPARATUS FOR SUPPORTING AN AUDIO/VIDEO SYSTEM WHICH INCLUDES A THIN SCREEN VIDEO DISPLAY UNIT", naming Basil Norman Freeman as the inventor. The contents of the provisional application are incorporated herein by reference in their entirety, and the benefit of the filing date of the provisional application is hereby claimed for all purposes that are legally served by such claim for the benefit of the filing date.

BACKGROUND OF THE INVENTION

The present invention relates generally to apparatus for supporting an audio/video system which includes a thin screen video display unit and related audio/video components such as tuners and other user controls, loudspeakers, and electrical and electronic circuitry and subsystems.

With the introduction of new technologies, there has been a proliferation of new television sets with thin screen video display units. These televisions are typically mounted on table tops, walls or purpose-built television cabinets. When so mounted, they often are no longer portable or otherwise easily movable from one room in a house or apartment to allow viewing in another room of the house or an apartment. Further, in a variety of home environments, such televisions can have an unwanted dominant presence within a given room at times when it is desired to use the room for other purposes.

SUMMARY OF THE INVENTION

The present invention addresses the foregoing limitations by providing apparatus that enables an audio/video system which includes a thin screen video display unit to be supported in a manner which allows deployment and retraction of the display unit from a housing forming part of the apparatus, and which concurrently provides self-contained support for related audio/video components such as those noted above.

More particularly, in a broad aspect of the present invention, there is provided apparatus for supporting an audio/video system, the system including a thin screen video display unit, video components operatively coupled to the display unit for generating video

signals displayable by the unit, and audio components for generating audio signals. The apparatus includes an elevator mechanism for the display unit and an exterior housing.

The exterior housing comprises a front panel, a rear panel, and opposed side panels extending between the front and rear panels and upwardly from a base of the housing to a top of the housing, the latter including a narrow, elongated opening sized to permit upward and downward movement of the display unit through the opening. The video and audio components are fixedly mounted to the housing. In preferred embodiments, the rear panel, side panels and top are formed as a single unit which is removably connectable with the base. This facilitates ease of access to the interior of the housing when servicing or repair is necessary.

The elevator mechanism extends upwardly within the exterior housing and comprises an elevator platform adapted to carry the display unit and means for moving the platform between a lower position where the display unit when carried by the platform is retracted into the mechanism and an upper position where the display unit when carried by the platform is deployed above both the elevator mechanism and the exterior housing. In preferred embodiments, the apparatus includes a swivel mounting for supporting the display unit and permitting rotational movement thereof with respect to the platform when the platform is in its upper position.

Apparatus in accordance with the present invention can be readily configured in a slim, compact manner allowing for optimal television viewing whilst maintaining an attractive appearance and remaining portable or easily movable from one location to another. Movement around the home or an office can be done safe in the knowledge that sensitive electronic components are housed in a protected position inside the apparatus.

Further, the apparatus can be easily set-up to require no external peripheral devices such as a DVD player or amplifiers or speakers. This feature can prove to be advantageous for those who do not wish to be bothered with the laborious task of purchasing and setting-up external peripheral devices. Typically, a user would only have to connect to a mains electrical outlet to view DVD's and to desired external media sources (e.g. a cable connection).

In addition to the foregoing, the present invention possesses various benefits and advantages over known retractable thin screen and Cathode Ray Tube (CRT) televisions. In particular the invention can be mass produced at a lower cost since it only requires that the thin screen video display unit can be extended and retracted. Other known thin screen retractable television enclosures require that all of the main components be retracted. This

requirement necessitates the use of relatively heavy-duty lifting mechanisms such as chain drive or rack and pinion type mechanisms. Because less weight is carried, the present invention can use a simple drive belt mechanism which is faster, quieter and more economical to manufacture.

A practical example of the flexibility possessed by the present invention resides in its ability to adapt to the daily schedule of many users. Depending on the configuration, it typically could be used in the daytime for audio purposes using an optically readable disk player or AM/FM components. At this time the thin screen video display unit would be held within the housing in a retracted position. The apparatus can then blend unobtrusively with the decor of a room. At night, the thin screen video display unit can be raised for television viewing. Advantageously, the base of the apparatus can be provided with wheels to enable the apparatus to be wheeled into alternate locations within a home or office.

A further practical example of the flexibility possessed by the present invention is utilization in locations with limited space. As indicated above, the apparatus can be unobtrusive and can compliment the decor of small rooms when the thin screen video display unit is in a retracted position. It can be advantageously set-up in the smaller sized rooms typically found in hotels and hospitals. As it is portable or easily movable, it readily can be removed for repair and/or replacement as required.

A further practical example of the flexibility possessed by the present invention is it's use in educational institutions where portability and ease of set-up are important features. Whilst the screen is in its retracted position, it and sensitive audio/video components will be well protected from physical harm when stored in an unsupervised environment.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a front perspective view of apparatus in accordance with the present invention with a thin screen video display unit deployed from the apparatus.

FIG. 2 is a rear perspective view of the apparatus shown in FIG. 1.

FIG. 3 is the a side elevation view of the apparatus shown in FIG. 1.

FIG. 4 is a front perspective view of the apparatus shown in FIG. 1 when the thin screen video display unit is in a retracted position hidden from view.

FIG. 5 is a top view of the apparatus shown in FIG. 1.

FIG. 6 is a bottom view of the apparatus shown in FIG. 1.

FIG. 7 is a partially exploded rear perspective view showing the base, front panel, and an elevator mechanism forming part of the apparatus shown in FIG. 1. Various audio/visual components are also shown..

FIG. 8 is a rear perspective view showing the base, front panel, and elevator mechanism as depicted in FIG. 7, but when in their assembled positions. As well, FIG. 8 illustrates the side and rear panels and the top of the exterior housing shown in FIG. 1 exploded away from the base and front panel of the housing.

FIG. 9 is a cross-sectional view taken in a vertical plane bisecting the view shown in FIG. 1, and which shows the relative positioning of various internal components of the apparatus.

FIG 10 is a top cross-sectional view, partially cut-away, taken in a horizontal plane through the upper part of the view shown in FIG. 9, and which shows the positioning of rollers and electromagnetic locking pins associated with the elevator mechanism.

FIG. 11 is an enlarged fragmentary perspective view of a motor, shaft and drive belt forming part of the elevator mechanism.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Apparatus for supporting an audio/video system constructed in accordance with the present invention is shown in an assembled condition in FIGS. 1-6. The apparatus includes an exterior housing generally designated 10, such housing including a front panel 12, a rear panel 14, and opposed side panels 16, 18 extending between the front and rear panels. All of such panels extend upwardly from a base 20 of the housing to a top 22 of the housing.

As indicated in FIG. 7, front panel 12 is connected to base 20 by means of L-shaped brackets 50 which are secured to both panel 12 and base 20 (e.g. with screws). Rear panel 14, side panels 16, 18 and top 22 are formed as a single unit which is releasably connectable to front panel 12 (e.g. with screws). The panels, base 20 and top 22 should all be formed from sturdy material, preferably laminated wood or a suitable polymeric material.

Side panels 16, 18 each include a handle recess 24 to facilitate movement and lifting of the apparatus. Movement is further facilitated by wheeled castors 26 mounted on the underside of base 20 (see FIG. 6).

Top 22 includes a centrally disposed, narrow, elongated opening 30 which is sized to permit upward and downward movement of a thin screen video display unit 90 (which includes a display screen 92) through the opening. In FIGS. 1-3, display unit 90 is shown in

a position deployed above housing 10. In FIG. 4, display unit 90 has been retracted into housing 10 and accordingly is not visible. Preferably, display unit 90 is supported by a swivel mounting as described below and which permits rotational movement of the unit on a vertical axis for convenient viewing of screen 92.

It is noted that the present invention is suitable for various types of thin screen displays (e.g. liquid crystal diode, plasma, and organic light-emitting diode screens) of various sizes. Display unit 90 is being described herein only to the extent that it is relevant to the operation of the invention.

In more detail, and as best seen in FIGS. 2-3 and 6-11, display unit 90 is carried atop the lower cylindrical portion 160 of a swivel mounting. As shown in FIG. 9, the bottom of portion 160 rests atop an elevator platform 150 and is retained in the position shown by a retaining ring 162 which is secured to the platform by bolts or other suitable means (not shown). Relative to platform 150, ring 162 permits rotational movement of cylindrical portion 160 but prevents upward movement. The swivel mounting also includes a bracing arm 161 which extends upwardly from male portion 160 along the back of display unit 90. Elevator platform 150 forms part of an elevator mechanism generally designated 100. A central opening 163 extends upwardly through platform 150 and male portion 160 to route power and video signal cabling up to display unit 90 from a cable connector 164 positioned immediately below opening 163.

Elevator mechanism 100 includes a supporting framework 102 having lower flanges 104 to secure the framework to base 20 of housing 10 (e.g. with screws). The framework may be formed from injection molded glass-fibre polymeric material, sheet metal or other suitable material. As well, elevator mechanism 100 includes a pair of drive belts 120 and a pair of associated drive motors 130 on opposite sides of framework 102. Each belt 120 extends around associated upper and lower rotatably mounted shafts 122, 124. Each shaft 124 is connected to an associated one of motors 130 as a drive shaft and includes a spindle portion 126 to directly engage its associated belt 120. The distal end of each shaft 124 is supported by a respective housing 129 fixed to framework 102 where the shaft is permitted to rotate, preferably on bearings (not shown) forming part of the housing. Preferably, belts 120 and the spindle portion of each shaft 124 are toothed to better ensure that there is no slippage of the belts on the shafts. As best seen in FIG. 10, opposed ends of shafts 122 are also carried in housings 129 fixed to framework 102. Shafts 122, 124 may be constructed of a steel alloy or other suitable material.

As seen in FIGS. 9 and 10, opposed ends of platform 150 are secured by screws 133 to belts 120. In FIG. 9, the platform is shown in an upper position where display unit 90 is

deployed above both elevator mechanism 100 and housing 10. By operating motors 130 in unison such that belt 120 on the left side of FIG. 9 rotates clockwise and belt 120 on the right side of FIG. 9 concurrently rotates anticlockwise at the same rate, platform 150 may be moved from the position shown to a lower position where display unit 90 is fully retracted into elevator mechanism 100 (and, necessarily, housing 10). Preferably, motors 130 are controlled by a microprocessor (not shown) programmed to ensure that desired movements up or down are in unison.

To better facilitate the smooth raising and lowering of platform 150, and as shown in FIG. 10, the platform includes wheels 170 rotationally mounted at inset positions in the platform, but extending outwardly therefrom to run within guide rails 172, 173 that extend vertically along inside wall surfaces of framework 102. Platform 150 further includes pin recesses 180 sized to be engaged by locking pins 182. Each locking pin 182 is carried by a pin housing 184 and is spring loaded. Vertically, the relative position of the locking pin housings is best indicated in FIGS. 6-8.

In the absence of control (e.g. a total loss of power to the apparatus), pins 182 spring from their housings to the positions shown in FIG. 10. When control is present, the pins preferably engage platform 150 in the manner shown if the platform is in its upper position, but only so long as there is no command to lower the platform. If there is a command to lower the platform, then the pins are electromagnetically retracted from the platform against the spring bias and remain retracted until there is a subsequent command to raise the platform to a position where display unit 90 is fully deployed and until that position is actually reached. All of these functions can be readily implemented with microprocessor control easily designed by those skilled in the art. Accordingly, they are not discussed in any further detail herein.

At this juncture, it should be noted that the only substantial weight component which is carried by platform 150 is display unit 90. Apart from wires, cabling and incidental connectors, all of which are relatively lightweight, the embodiment described above does not require any major (viz. relatively heavy) video components other than display unit 90 to be carried by platform 150, nor does it require any audio components to be carried by platform 150. Accordingly, elevating mechanism 100 can be advantageously less robust and therefore less costly than mechanisms which are required to carry the significant weight of audio and video components other than a display unit.

In the drawings, audio and video components are generally illustrated merely in a representative manner. With any given audio/video system, it will be understood that such components include receivers, amplifiers, speakers, power supplies, controllers, signal

processing circuitry, connectors, wiring, cabling and so forth can all be a matter of routine design choice.

Accordingly, in addition to display unit 90, and only by way of example, the audio and video components supported by the apparatus shown in the drawings include:

(a) a control panel 400 for receiving input commands such as tuning or channel switching commands, volume control commands, switching commands to raise or lower platform 150, and a power switch to turn AC power received on power cord 402 on or off (such commands may be provided manually and/or with remote commands such as with infra red remote control, RF control, etc.). Control panel 400 is carried in a box 411 mounted to front panel 12.

(b) a player 410, also carried in box 411, for optically readable disks such as CDs and/or DVDs;

(c) left and right speaker assemblies 420, 422 mounted to front panel 12 behind grills 424, 426, a center speaker 428 mounted to front panel 12 behind a grill 430, and a sub-woofer speaker 432 mounted to front panel 12 behind a grill 434 (such grills may be made from a polyester fabric or molded polymeric material suitable for the propagation of sound);

(d) a panel 440 mounted to rear panel 14, such panel including a plurality of connectors for the input and output of digital and analog data including, for example: left and right output connectors 442, 444 for external speakers, a DVI - HDTV input 446 which allows for reception of fully uncompressed high definition signals from any similarly equipped DVI set-top box or computer;

(e) major electronic components 450, 451, 452 mounted to base 20 used for the operation of the system (these components are cooled by a fan 454 mounted in base 20).

It will be noted that none of the components in the above list are carried by platform 150. The most sensitive and heavy of such components preferably are located in the lower 1/3 of the apparatus. This arrangement advantageously ensures the stability of the apparatus from falling over and protects the most sensitive electronic components.

Those ones of components 450, 451, 452 required for operation of display unit 90 are connected by wiring or cabling (not shown) to connector 166 mounted on cross-member 121 of framework 102. A flexible, shielded ribbon cable 168 fabricated from copper or other

suitable material extends upwardly from connector 166 to connector 164 for providing power and video signals to display unit 90. When the display unit is in a retracted position, cable 168 will be bent on itself.

A variety of modifications, changes and variations to the invention are possible within the spirit and scope of the following claims, and will undoubtedly occur to those skilled in the art. The invention should not be considered as restricted to the specific embodiments that have been described and illustrated with reference to the drawings. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures.